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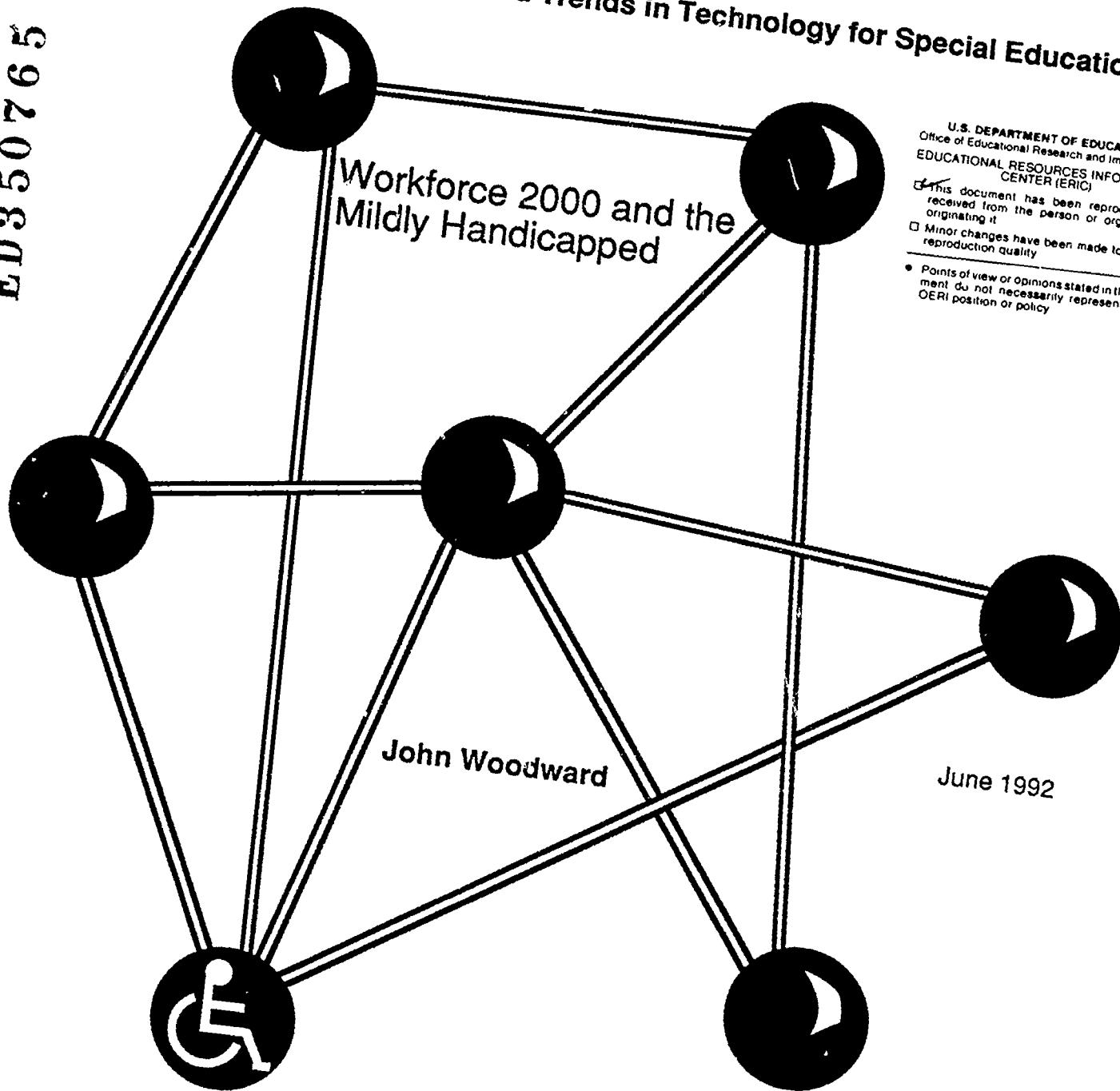
## ABSTRACT

As part of a 3-year study to identify emerging issues and trends in technology for special education, this paper explores the changing nature of the workforce in relation to concurrent changes in education services for students with mild disabilities. Current trends are identified and projections for the next decade are offered, which include the decline of manufacturing and increasing trends toward a service economy, as well as changing expectations for workers in the direction of demanding higher skill levels and decreased opportunities for unskilled workers. The implications of these trends for special education suggest that it is imperative that special education participate in substantive reform and reconceptualize students with mild disabilities to avoid negative stigmatization and related economic consequences. Special educators are urged to be proactive in defining new educational standards which reflect the coming economic environment. The use of effective technology is offered as one way to enable special education students to attain higher levels of performance. A more comprehensive view of education to include adult training and retraining is also recommended. (Contains 19 references.) (DB)

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Identifying Emerging Issues and Trends in Technology for Special Education

ED 350765



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PREFACE

COSMOS Corporation is conducting a study of the issues and trends affecting the role technology will have in the 21st century for individuals with disabilities. This three-year study is funded by the U.S. Department of Education, Office of Special Education Programs (OSEP), under Contract No. HS90008001.

COSMOS Corporation was founded in 1980, and is located in Washington, D.C. Since its inception, the firm has conducted a wide range of applied social science projects for public and private organizations and foundations. COSMOS's specialties include: conduct of case studies; identification and validation of exemplary practices; evaluation of education, job training, and human services programs; provision of technical assistance to state and community agencies; and strategic planning for public agencies and public firms.

Project participants include expert panels, project fellows, an advisory board, a consortia of practitioners, and project staff. These experts in the fields of technology and special education have come together to examine the issues and trends in these two fields, and how they impact the use of technology for special education in the 21st century. Three expert panels have started examining these issues: one with a focus on technology outside the field of education, one on special education instruction, and one on evolving service delivery systems in special education. Over the three year period their research will be synthesized and become the basis for predictions about the future.

This document is one of the papers commissioned in the first year. The purpose of the paper is to present information on one or more issues as part of the expert panel discussions. It is being shared with people inside and outside of the project to stimulate discussion on the impact of technology in the early 21st century. Readers are welcome to comment on these findings and contact COSMOS Corporation for further information.

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"THERE IS NO REASON FOR ANYONE TO HAVE A COMPUTER IN HIS HOME"  
KEN OLSON, CHAIRMAN OF DIGITAL EQUIPMENT CORPORATION, 1977.

Predictions, as Erwin Schrödinger once commented, are especially difficult, particularly when they involve the future. Projecting trends in the U.S. economy over the next two decades is immensely difficult given the innumerable contingencies that will affect its growth, stagnation, or decline. Productivity indices, world growth rates, environmental issues, federal monetary policies, and the national debt are but a few of the determining factors in the future state of the economy. Economic projections in *Workforce 2000* (Johnston and Packer, 1987), for example, while accurate on many accounts, predicted a surplus of monies for state and local governments in the early 1990's. Clearly this is not the case.

However, many research foundations, private interest groups, and leading economists agree on the general makeup of the U.S. workforce for the next decade. Their projections are based on fundamental shifts in the U.S. economy that have occurred over the last 20 years (e.g., from manufacturing to service, from a national to a global economy). The intent of this paper is to explore the changing nature of the workforce as well as examine concurrent changes in education services for mildly handicapped students over the near term.

#### Toward a Service Economy

A stream of reports and popular books over the last five years, such as *Workforce 2000*, *The Work of Nations*, *Workplace 2000*, and *The Knowledge Value Revolution*, present a surprisingly consistent picture of working conditions for the average American as we approach the end of the century. At a global level, Robert Reich (1991) captures the dramatic changes in the American economy--which began over a decade ago --in this fashion.

We are living through a transformation that will rearrange the politics and economics of the coming century. There will be no national products or

technologies, no national corporations, no national industries. There will no longer be national economics, at least as we have come to understand that concept. All that will remain rooted within national borders are the people who comprise a nation. Each nation's primary political task will be to cope with the centrifugal forces of the global economy which tear at the ties binding citizens together--bestow ever greater wealth on the most skilled and insightful, while consigning the less skilled to a declining standard of living. (p. 3).

One central concern expressed by labor, the media, and political organizations is the "hollowing" of American industries--the flight of manufacturing jobs to foreign countries. "The total value of American imports from American-owned factories abroad rose from \$1.8 billion in 1969 to almost \$22 billion by 1983, adjust for inflation" (Reich, 1991, p. 73). In addition, manufacturing is expected to provide only about 10 percent of the jobs in the year 2000, down from 28 percent in 1980. Reich and others argue that the reasons for this transfer of labor is often misunderstood. Two underlying reasons for the decline in manufacturing make this trend somewhat inevitable, albeit regrettable for the many Americans who have relied on this kind of work for their livelihoods.

First, economic growth in the U.S. is now fully dependent upon world growth (Johnston and Packer, 1987). Consequently, economic growth in the U.S. must be understood in global terms. With an international marketplace and the availability of cheaper labor, manufacturing in other parts of the world is both sensible and less expensive. This is potentially beneficial to the U.S. because the gradual rise in the standard of living of these countries translates into opportunities for the sale of different kinds of products from the U.S. (e.g., financial services, entertainment, medical services, high technology).

Second, manufacturing will also decline as a nominal share of the GNP as production facilities in the U.S. become increasingly efficient. They will require "fewer resources of all kinds--not only fewer people,

but less capital and energy as well--to produce the same or greater quantities of goods" (Johnston and Packer, 1987, p. 26). U.S. factories will become increasingly automated. Newly designed factories for the lumber, automotive (e.g., the Saturn plant), and computer (e.g., Apple, NeXT) industries already testify to the need for fewer workers. Thus, the consequent efficiency (and loss of jobs) makes the movement of U.S. industries abroad as much inevitable as it is threatening.

The positive side of this shift in manufacturing is the increased potential for "upstream and downstream" sides of a product (e.g., research, design, marketing) to occur anywhere in the world. Countries such as the United States excel in these aspects of production, and they will be afforded greater opportunities for their specialized talents in a global market. This kind of specialization by a country has been a long predicted outcome of world capitalism (e.g., Samuelson, 1976), and is at the heart of current projections for the workforce over the next decade (Johnston and Packer, 1987; Reich, 1991).

#### Changing Expectations for the Worker

Figures 1 and 2 below, taken from the Bureau of Labor Statistics (Occupational Outlook Handbook, 1990-91), portray the kind of categorical shifts in occupations for the next decade. The demonstrative shift is toward the service producing sector of the economy.

Service industries are often stereotyped as low-productivity and low-wage jobs (e.g., fast foods, small-chain retail outlets, sales). This is certainly one aspect of such an economy, though wages for such jobs often does not provide a family income. However, there are many service-oriented jobs which entail high wages and the use of advanced technology (Johnston and Packer, 1987). Occupations in this type of service industry typically involve finance, law, entertainment, research and development, and medicine. It is the gulf between the two

Figure 1  
CATEGORICAL SHIFTS IN OCCUPATIONS  
FOR THE NEXT DECADE

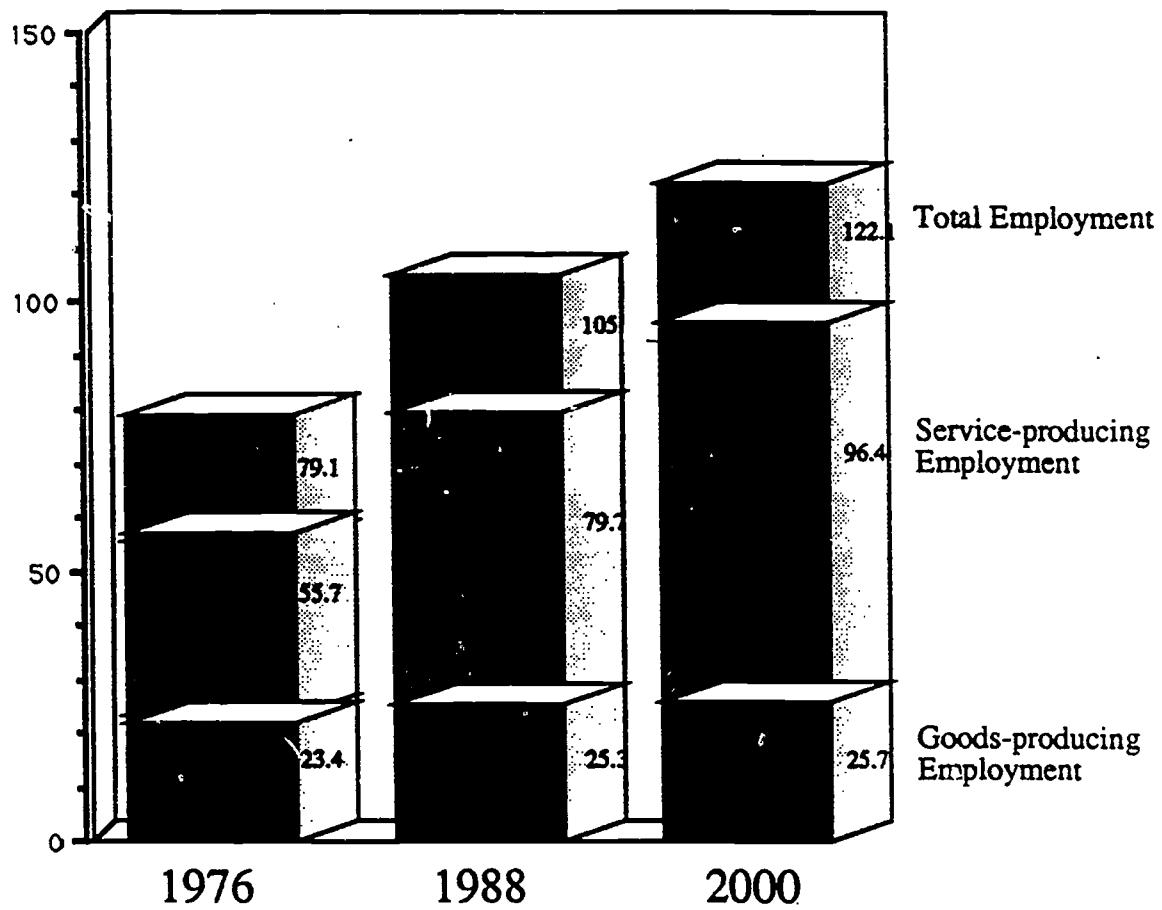
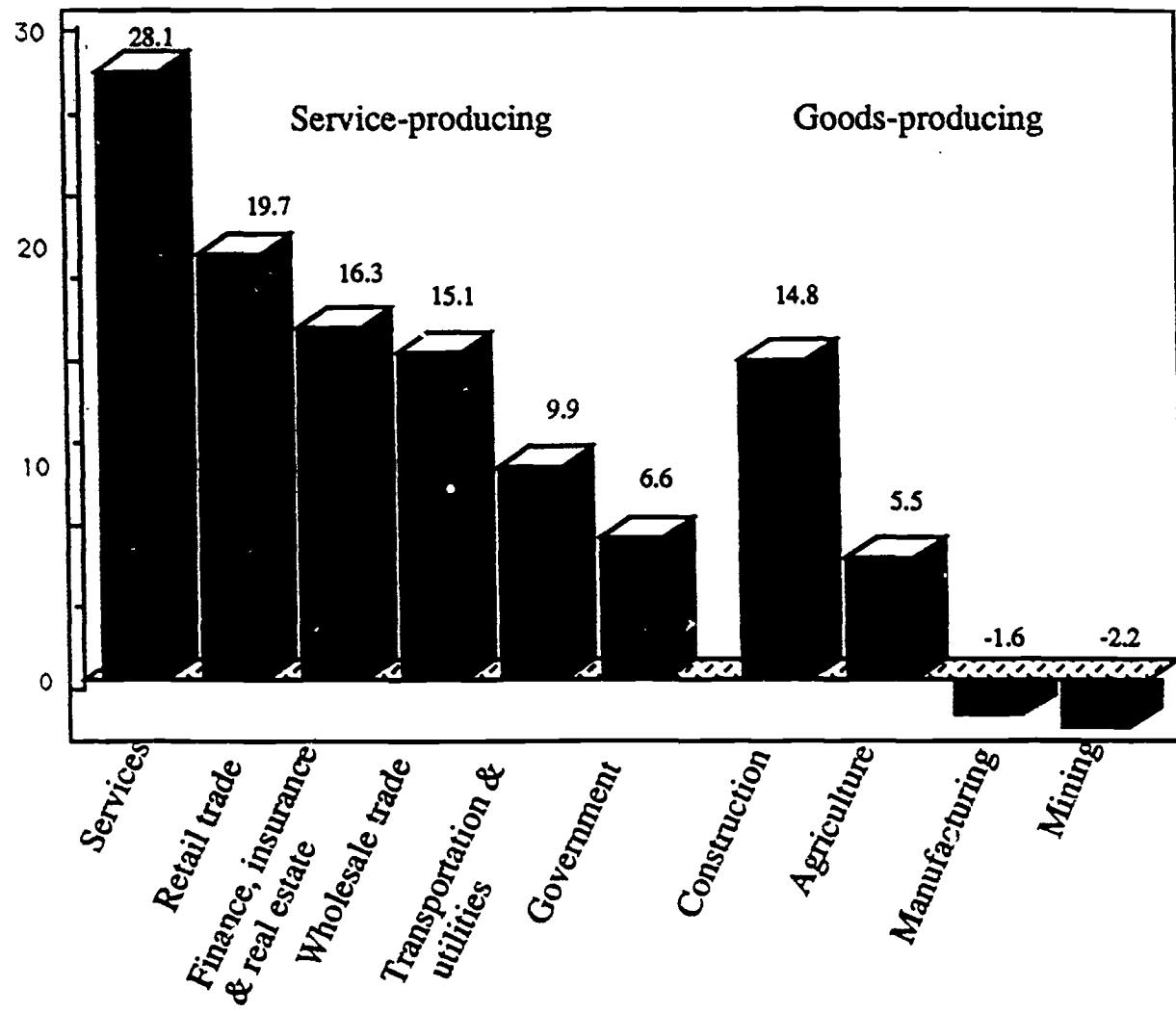


Figure 2  
PERCENT CHANGE IN EMPLOYMENT 1988-2000



types of service industries and its implication for personal income that is essential to grasp. This is clearly stated in Workforce 2000.

The workers who will join the labor force between now and the year 2000 are not well-matched to the jobs that the economy is creating. A gap is emerging between the relatively low education and skills of new workers (many of whom are disadvantaged) and the advancing skill requirements of the new economy. Although this gap can certainly be bridged by education, training, automation, and other strategies, it presents a great challenge to American workers and employers (Johnston and Packer, 1987, p. 75).

The new jobs in service industries which will offer a family income or higher will demand higher skill levels than the jobs of today. They will require much higher literacy in reading, communications, mathematics, and science. Thus, the high school diploma that represented an adequate level of education two decades ago will be thoroughly inadequate as we move toward the year 2000. The majority of all new jobs at this second income tier will require post-secondary education.

It is likely that the two different types of service jobs will lead to a less equitable distribution of income. According to the author of *The Wealth of Nations*,

Between 1977 and 1990, the average pretax earnings of the poorest fifth of Americans declined by about five percent; during the same interval, the richest fifth became about nine percent wealthier. The income disparity has widened fastest between people who graduated from college and those who graduated only from high school or dropped out. This trend is not unique to the United States; many other advanced industrial nations are witnessing a similar divergence (Reich, 1991, p. 7).

By the mid-1980's many Americans were poorer, with the middle class sagging and the rich becoming much, much richer. From 1973 to

1987, the value of a steady job for a male with a high school diploma declined 17 percent. "By 1980, our typical male college graduate earned about 80 percent more than his high school counterpart; by 1990, this gap had nearly doubled" (Reich, 1991, p. 206).

Barring a very large immigrant movement, the workforce will also grow more slowly than any other time since the 1930's. By the year 2000, the population will reach about 275 million, which is three-fourths of one percent per year growth during the 1990's. This is well below the average for the last two decades. Surprisingly, this slowing of the U.S. population will do little to ameliorate the situation.

In fact, it has a potentially stark effect for unskilled laborers who will be consigned to low-level service jobs. Fewer of these jobs will become available for the same reasons that manufacturing work is disappearing:

- Service industries will be continually automating, particularly as employers have an increasingly difficult time finding skilled workers for the wages they are willing to pay; and
- Continued improvements in telecommunications and world transportation systems will force U.S. workers to compete on a worldwide level for these jobs.

"Between 1985 and 2000, the world labor force will grow at a compound rate of more than two percent, adding more than 600 million new job seekers to the world workforce" (Johnston and Packer, 1987, p. 47). Furthermore, not all of these workers will be unskilled, with the number of people attending college worldwide having doubled in the last 20 years. The increased level of education and international mobility will increase competition for jobs and even hold down wages for what are currently considered "skilled" occupations.

#### Implications for Special Education

As the economy shifts toward service industries, there will be much greater reliance on human capital than on the refinement of material or natural resources. This implies a significant change in the nature of education. Figure 3 contrasts the kinds of skills demanded of an industrial and a service (i.e., an "information") economy.

Those who succeed will need not only a firm grounding in mathematics, basic science, and reading, but they will need to possess broader intellectual abilities in abstraction, system thinking, experimentation, and collaboration (Reich, 1991). Work will demand a high level of interpersonal and communication skills as businesses move from extensive bureaucracies to organizations that delegate responsibility to small teams (Boyett and Conn, 1991; Johnston and Packer, 1987). Many workers will also need high levels of "self-direction" as technology will enable more people to work at home (Turnage, 1990).

Furthermore, "as society changes," so will the skills and knowledge needed for individual productivity and satisfaction. The higher levels of cognitive skills must be learned--and learned as early in life as possible. People will need skills in decision making, problem solving, creativity, critical thinking, evaluations, analysis, and synthesis" (Cromer, 1984, p. 18).

The need for higher entry skills was demonstrated rather dramatically when in 1987, Nynex Corporation's New York Telephone Company had to test approximately 60,000 applicants to fill 3,000 positions (Bernstein, 1988). Sadly, this report estimates that more than three-fourths of the nation's new workers will have limited verbal and written skills, and they will only be able to compete for only 40 percent of the new jobs.

Unfortunately, the cognitive abilities demanded by the new work environment are in direct contrast to what defines the typical special education student. Intensive and innovative educational efforts, it would seem, are the most logical way to enable many special education

**Figure 3**  
**DIRECTIONS FOR EDUCATION**

<u>Area</u>	<u>In An Industrial Society</u>	<u>In An Information Society</u>
<u>Goals of Education</u>		
Cognitive Goals	Basic Skills	Higher order skills and basic skills
	Specific training Unicultural Literacy	Generalizable skills Global education Many literacies, more than one language
Affective Goals	Large organization skills Organization dependent	Small group skills Independent entrepreneurial
Curriculum	Learning simple discipline skills Standardized programs Computer as a vocational skill	Interdisciplinary programs Varied program options Computer as learning tool in all programs
Job Preparation	Single-career preparation Late skill development Distinct vocational educations programs	Multiple-career preparation Early skill development Career/vocational education as integral part of educational experience
<u>Delivery Systems</u>		
Changing Institutional Patterns	Single district system focus Central office management	More variety at building level School based management

Source: High Tech Schools, Cromer, 1984

students (particularly the mildly handicapped) to acquire the intellectual skills necessary for work in the coming two decades.

While recent calls for radical educational reform are beginning to address the general needs of the new workforce, they typically appear in the form of imperatives and grand goals rather than material plans of action. America 2000, for example, urges dramatic change for the educational community in a way that is reminiscent of the reform agendas of the Sputnik era of the early 1960's and the Nation at Risk report a decade ago. Like these earlier reactions to a superpower's prowess or foreign competition, there is little indication that the lofty goals put forward in a document like America 2000 consider the role of special education students.

Should special education not take part in substantive reform--changes in instructional methods that prepare students for more demanding occupations--the economic implications are bleak for this "class" of individuals. Special education students, even if they graduate from high school, will likely join the growing underclass of workers who will fill low paying service sector jobs and, at times, be subject to increasingly pronounced patterns of structural unemployment (Johnston and Packer, 1987). Many learning disabled students already acquire jobs of low social status and then express frustration and dissatisfaction with their work and school training (Kavale, Forness, and Bender, 1988). Over the next 20 years, their ability to make the transition to family wage jobs will be more difficult than ever before, if not impossible.

The most dramatic implication of the shift in job skills has to do with the way we conceptualize mildly handicapped students. Federal legislation as well as the profession community at large have characterized this part of the special education population almost exclusively in intellectual, medical, and/ or behavioral terms. Should increasing numbers of mildly handicapped students drift toward marginal occupations and unemployment, the connection between a mildly handicapped label (e.g., LD, SLD, EMR, BD, SED) and a future economic livelihood will be much more apparent. As much as special education

services for these students may connote some kind of unique or individual assistance, it will also imply consignment for many to a future of poverty.

### The Educational Challenge

As stated previously, there is no indication that major educational policy statements hold a place for special education students. Furthermore, even if their goals are not met (e.g., America 2000--high school graduation for at least 90 percent of the students, adult literacy for everyone, student achievement in mathematics and science that is the highest in the world), the world economic conditions that generated these expectations are not likely to abate. Special education, then, must be proactive in defining new educational standards which reflect the economic environment of the coming decades.

To a large extent this will entail a thorough reanalysis of special education instruction. Recent observational research (Gersten and Woodward, 1990; Haynes and Jenkins, 1986; Ysseldyke, O'Sullivan, Thurlow, and Christenson, 1989) suggests that instruction in special education classrooms is highly similar to that found in general education settings (e.g., a considerable amount of time is devoted to completing routine, application-oriented activities). Further research (Allington and McGill-Franzen, 1989) indicates that even more time is devoted to seatwork activities in pull-out settings. This tendency for extended practice on materials that are not intellectually challenging holds true even when special education students use computers (Becker and Sterling, 1987; Rieth, Bahr, Okolo, Polsgrove, and Eckert, 1988; Semmel and Lieber; 1986).

What will replace the current style and content of teaching is, of course, the challenge that faces special educators. Instruction will not only have to prepare students for the new work environment, but do so at an accelerated rate. The growing presence of computers in the workplace (Turnage, 1990) suggests that technology should play a central role in curricular reform. In this vein, Salomon, Perkins, and

Globerson's (1991) distinction between the effects with and of technology is relevant.

The potential effects with technology have to do with changes in performance while students are using technology. The ability of the machine to enhance our work (e.g., word processors, graphic programs) or to perform mundane or routine tasks (e.g., spreadsheets) comprise an intellectual partnership that develops over time and increases productivity.

The effects of technology have more impact at the cognitive level. Technology can augment our intelligence. ICAI programs, simulations, virtual reality, etc., represent this aspect of a technology partnership. Effective technology enables special education students to "mindfully engage" in learning and attain higher levels of intellectual performance than what is typically found in today's classrooms (Salomon and Perkins, 1987; Salomon et al., 1991).

To be sure, most school systems show little sign today of shifting toward such powerful technologies. In fact, the commitment to curriculum/technology purchases may actually decrease in the near term as districts, like cities and states, face shrinking or deficit budgets and more monies need to be allocated to replace aging facilities and increased wages. These issues, in conjunction with the generally conservative nature of education (i.e., its resistance to change) lead some (e.g., Cohen, 1987) to the conclusion that the technology revolution will happen on the periphery of the public school system. Whether or not this occurs remains to be seen. Nonetheless, many would agree that radical changes are needed in the next five years if public schools are to adequately prepare students for the next two decades of work.

Finally, special education's agenda must be comprehensive. It is natural for many in the field to think exclusively in terms of K-12 services. After all, this is the brief period in the lives of most special education students (i.e., those with learning disabilities) when they interact with the system of special education. Subsequent special assistance for the majority of these individuals (e.g., job

training, welfare), when necessary, typically occurs without special education's labels.

However, the changing nature of work will demand continual retraining for all adults. "Forecasts predict that every four or five years one of the partners [in a household] will leave the ranks of the employed to receive the additional knowledge and skills demanded by changes in technology and the workplace" (Cromer, 1984, p. 18). While the federal government and private industry now spend billions of dollars to retrain workers, there is still little national consensus as to what new skills all workers should expect to learn over the course of their worklives. At present, there is no systematic effort to ensure that all workers are constantly reinvesting in themselves to avoid obsolescence (Johnston and Packer, 1987).

If special educators are able to provide constructive instructional solutions at the K-12 level, they may well be applicable to a broader audience of adult workers. Instructional designers, computer educators, and cognitive scientists working in the special education arena are likely to find that innovative programs can act as templates for a wide array of job training programs. Creating the links between these individuals and the federally and/or corporate sponsored training programs of the future will be an essential undertaking over the next decade.

#### Concluding Remarks

Calls for educational reform over the last three decades suffer from a "cry wolf" phenomena. Goals are set, and educators are exhorted by politicians, corporate leaders, and the media to raise student performance. Little seems to change and we return to business as usual. Were the U.S. economy more insulated and operating as it did from the end of World War II to the late 1960's, we could regard proposals such as America 2000 as another ebb in the recurrent cycle of public demands for reform. Unfortunately, global economic forces--forces over which we have only partial control--are now driving the need for serious educational reform. An international marketplace is

now making the connection between the quality of a student's education and his or her economic well-being far more explicit than ever before.

In this context, special education faces many obstacles. Its role in the educational reform that will better prepare students for work in the year 2000 has not been clearly articulated. Second, most special education students by definition lack many of the skills needed to compete for highly skilled service industry jobs. Unless education for these students dramatically changes, this can only imply that the bulk of special education students are destined to fill low-level and low-wage occupations. Finally, instructional systems that will address the kind of intellectual development necessary for highly skilled occupations tend to be on the periphery of the field. Undoubtedly, educational technologists, instructional designers, and cognitive scientists working in special education have much to offer, but their knowledge has not been marshalled around the intellectual and interpersonal skills needed in the work environment of the coming two decades.

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PAPERS AVAILABLE FROM COSMOS

The papers commissioned by the project are available upon request include:

- "Technology and Interactive Multimedia" by Ray Ashton;
- "VLSI Technology: Impact and Promise" by Magdy Bayoumi;
- "Conceptual Framework: Special Education Technology" by Richard Howell;
- "Demographic Characteristics of the United States Population: Current Data and Future Trends" by Beth Mineo;
- "School Reform and Its Implications for Technology Use in the Future" by John Woodward;
- "Textbooks, Technology, and the Public School Curricula" by John Woodward;
- "Workforce 2000 and the Mildly Handicapped" by John Woodward;
- "Virtual Reality and Its Potential Use in Special Education" by John Woodward; and
- "Annotated Bibliography: Training, Education Policy, Systems Change, and Instruction" by Lewis Polsgrove.

Copies of these reports are available upon request.